



Fact Sheet

Aquifer Protection Permit

Place ID 3507 LTF 46230

Individual Permit

Palo Verde Nuclear Generating Station

APP Inventory No. 105971

The Arizona Department of Environmental Quality (ADEQ) proposes to issue an aquifer protection permit for the subject facility that covers the life of the facility, including operational, closure, and post closure periods unless suspended or revoked pursuant to Arizona Administrative Code (A.A.C.) R18-9-A213. This document gives pertinent information concerning the issuance of the permit. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards at the Point of Compliance; and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). The purpose of BADCT is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., the local subsurface geology), to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer or to prevent pollutants from reaching the aquifer.

I. FACILITY INFORMATION

Name and Location

Permittee's Name:	Arizona Public Service Company
Mailing Address:	Palo Verde Nuclear Generating Station (PVNGS) P.O. Box 52034, M.S. 7626 Phoenix, Arizona 85072-2034
Facility Name and Location:	5801 South Wintersburg Road Tonopah, Arizona 85354-7529

Regulatory Status

The PVNGS has been in operation since 1985. The facility is operated by the Arizona Public Service Company (APS) and is jointly owned by seven utility companies. The PVNGS submitted a Notice of Disposal in 1985 and operated under Groundwater Quality Protection Permit (GWQPP) No. G-0077-07 issued by ADEQ in 1988. An Aquifer Protection Permit (APP) application was submitted for PVNGS on May 12, 1995. Additional information for the APP was submitted in 1999, 2000, 2002 and 2003. The original APP was issued to PVNGS on December 17, 2003. The APP authorized the operation of industrial wastewater surface impoundments and landfills located at PVNGS. A significant amendment to the area-wide permit was issued by ADEQ under the expedited permitting program in October 2007. The area-wide permit covers multiple APP regulated surface impoundments, several of which are being upgraded over the course of the next few years. A new surface impoundment, Evaporation Pond 3 is being permitted to allow additional evaporation

capacity and holding capacity for future operations and also so that wastewater from Evaporation Ponds 2 and 1 can be transferred out of those impoundments to allow repairs to current liner systems to be performed. The compliance schedule of the area-wide permit (Inventory No. 100388) requires the permittee to perform the upgrades.

PVNGS operates under other environmental permits, including a State of Arizona Reclaimed Water Permit (No. R100388) for the chlorination station associated with the effluent pipeline, a Hazardous Waste Identification Number for small quantity generation of hazardous wastes, and a Maricopa County Air Quality Operating Permit (No. 030132). The PVNGS is also regulated by the Arizona Radiation Regulatory Agency (ARRA) under Special Approval License No. 7-368 and the federal Nuclear Regulatory Commission (NRC) under a license. A full list of environmental permits for PVNGS is in the project file and is available for review upon request.

Facility Description

The power plant began operations in 1985 and is estimated to remain in operation for approximately 40-60 years. The 4,280 acre facility is located west of Phoenix, Arizona (Figure 1, Site Location and Property Boundaries). The PVNGS is an existing electric generating baseload power plant, utilizing nuclear fission for generation of electrical power. PVNGS is operated by the Arizona Public Service Company (APS). The Facility consists of electric generating units and cooling towers, solid waste handling and storage facilities (landfills), wastewater containment facilities (surface impoundments), a water reclamation facility and storage reservoirs, plant operation and maintenance warehouses, and administration buildings.

The generating Facility consists of three separate, identical generating units/reactors each equipped with three cooling towers. Following steam generator replacements and thermal up-rates, Units 1, 2 and 3 have a nominal net electrical output of approximately (1346 megawatts (MW), for a total plant capacity of about 4,038 MW. Each generating unit also includes associated structures: auxiliary building; radioactive waste building; fuel building; control building; diesel generator building; main steam support structure; access building; spray ponds and cooling towers; and an oil/water separator. The PVNGS also includes hazardous waste storage areas; low-level radioactive waste interim storage facilities; railroad and road facilities; fire protection and security facilities; control room simulators and other training facilities; and emergency facilities. A 500 KV switchyard is also located at the Facility and is managed and operated by Salt River Project. The switchyard is not regulated by this APP.

The area-wide APP authorizes the operation of six surface impoundments (including the two unlined sedimentation basins), closure of two former surface impoundments (the Retention Basins), and operation of a sludge disposal landfill and a rubbish landfill. Reclaimed wastewater, domestic wastewater, and industrial process wastewater is managed on site by recycling wastewater within the facility for 20 cycles or more, and maintaining wastewater collection systems and the storage reservoir.

This individual permit is for construction and operation of a new impoundment Evaporation Pond 3. The individual permit for Evaporation Pond 3 will later be combined with the area-wide permit through a permit amendment.

A new construction water holding pond was permitted under a separate Type 3.01 General Permit. Authorization to discharge under this general permit was issued on July 2, 2007, Inventory Number 105892, Licensing Time Frame (LTF) Number 44339, and Site Code (USAS) Number 508739-00. This lined pond will hold WRF and WTF wastewaters and water which will be used on site for dust control as authorized by the area-wide APP.

PVNGS purchases treated secondary effluent from the Phoenix 91st Avenue, Tolleson and Goodyear Wastewater Treatment Plants (WWTPs) for beneficial use as make-up cooling water and for other approved uses on-site. The effluent is transported through 36 miles of underground pipe originating at the City of Phoenix 91st WWTP. The pipeline passes through the Hassayampa Pump Station which is permitted under a separate APP. The WRF also receives wastewater from the Sewage Treatment Plant at the facility for reuse, and groundwater.

The WRF is exempt from APP requirements pursuant to A.R.S. §49-250(B)(22) but is described here for the purpose of clarifying APP permit related inspections. The on-site WRF is an advanced wastewater treatment plant, utilizing a multi-phase, biochemical treatment process. The WRF process includes six trickling filters, six first-stage solids contact clarifiers, six second-stage clarifiers, and twenty four gravity filters. The WRF treats a combination of reclaimed wastewater from the pipeline, Sewage Treatment Plant industrial wastewater/effluent, and groundwater. The WRF also has treatment facilities to provide domestic, demineralized and fire protection water. The final treated effluent discharged from the WRF is pumped to the 80-Acre Water Storage Reservoir (WSR) and 45-Acre Water Storage Reservoir prior to use on-site.

The PVNGS utilizes WRF treated reclaimed water and untreated groundwater for dust suppression at the site. Dust suppression is required by Air Permit No. 8600896 for PVNGS site operations. Use of this water for on-site dust suppression is authorized by the area-wide permit, based on water quality data provided by the applicant.

Hydrologic Setting

The ground surface elevation at the Facility slopes roughly north to south across the site with elevations ranging from 960 to 910 feet above mean sea level (msl). Multiple groundwater aquifers appear to be located beneath the site. A shallow aquifer is located at an approximate depth of 73 feet bgs in the northern portion of the site or a groundwater elevation of 876 feet msl (2001 data for Well PV-206A located south of the Units) and is within the Upper Alluvial Unit (UAU). At the periphery of the site this shallow aquifer may be located in the Middle Fine Grained Unit (MFU).

In the southern portion of the site, the depth to the shallow aquifer ranges from 40 to 61 feet bgs, with observed groundwater elevations of 866 feet msl (Well PV-14H in 2001), 872 feet msl (Well PV-34H), and 876 feet msl (PV-33H). Groundwater elevations in the shallow aquifer are in general declining, and groundwater has declined as much as 20 feet since the start up of plant operations in the 1980's. The decline may be related to drought conditions in Arizona coupled with pumpage in the lower aquifer south and southwest of the facility. However, in spite of declining water elevations in the shallow aquifer, some wells show slight increasing trends in elevation or a flat trend (which is neither increasing nor decreasing). Hydrographs of key wells have been submitted to ADEQ by APS and are a part of the file and can be reviewed upon request. Groundwater flow in the uppermost aquifer appears to be in a radial pattern outward from the center of the site.

The shallow aquifer is located above the Middle Fine Grained Unit (MFU) and in the MFU at the site periphery. The MFU reportedly acts as an aquitard, limiting downward/vertical migration of groundwater and pollutants. In some areas of the site, the top of the uppermost aquifer is the top of the Middle Fine Grained Unit (MFU) which is a unit that can be correlated in geophysical logs and cross sections throughout the Hassayampa groundwater basin and in some cases the upper most aquifer is in the MFU.

The MFU is characterized by massive, continuous layers of clays and silty clays interbedded with thinner layers and scattered lenses of clayey silt, clayey sand, and silty sand. The lower portion of the MFU includes the Palo Verde Clay which ranges in thickness from 60 to 80 feet. Review of cross-sections presented in the application suggests that the Palo Verde Clay aquitard laterally extends north, east, west and south of the site, but lays unconformably above a bedrock surface that outcrops near the southwestern boundary of the site, south and west of the Evaporation Ponds.

The regional aquifer which is used as the source of the majority of local drinking water is located in the Lower Coarse-grained Unit, beneath the Palo Verde Clay sub-unit of the MFU. Beneath this site, the regional aquifer is reported to be confined to semi-confined, exhibiting potentiometric surfaces that are elevated to levels above the coarser grained aquifer materials. In well PV-216R, a potentiometric groundwater elevation of 701 feet msl and a depth to groundwater ranging from 195 to 205 feet bgs is observed. Studies conducted in the northern portion of the site and also at the Redhawk Power Plant suggest that the regional aquifer may be under either confined to semi-confined conditions in these areas.

An intermediate aquifer has been identified above the top of the Palo Verde Clay, between the shallow and regional aquifers. While APS and ADEQ may have different hydrologic models regarding the degree of saturation between this aquifer and the shallow aquifer, this aquifer represents the lowest water bearing unit that can be monitored that is separated from the regional aquifer by a regional clay layer. Based on available data, it appears to be a suitable location for assessing any groundwater impact before the regional drinking water aquifer is reached by downward vertical migration.

Groundwater flow is generally to the south/southwest in the regional aquifer. Flow in the shallow aquifer radiates outwards from the center of the site. There are insufficient wells in the Palo Verde Clay aquifer to assess groundwater flow with accuracy.

II. BEST AVAILABLE DEMONSTRATED CONTROL TECHNOLOGY (BADCT)

One of the primary requirements of the Aquifer Protection Permit Program is BADCT. Facilities must be designed and operated in a manner to achieve the greatest degree of discharge reduction that is achievable. BADCT serves to protect groundwater quality by preventing wastewater from moving through the subsurface soils to underlying groundwater. In general, it is more cost effective to prevent groundwater contamination from occurring through use of engineering controls than it is to clean up groundwater after impact.

Evaporation Pond 3 is split into two cells 3A and 3B. Evaporation Pond 3 is a triple lined impoundment with a leak collection and removal/recovery system (LCRS). Current BADCT for industrial impoundments is double liner design with an LCRS. EP3 is lined with two 60-mil HDPE liners with a geonet drainage layer located between the liners which drains to collection sumps. The secondary layer is located above a geocomposite liner (GCL) which serves as the third liner. The design of the LCRS collection sumps prevents overflow unless the pond overflows while the liner leaks at a rate in excess of AL2.

BADCT for the PVNGS facility also includes the engineering design of the impoundment and liner systems, liner leakage monitoring systems, operational and maintenance practices for pollution control, water and wastewater treatment, water reclamation and reuse, water conservation, and the geological characteristics of the site.

Site Characteristics and BADCT

Site characteristics were not used in the BADCT demonstration for this APP-regulated facility.

Stormwater Routing and BADCT

Evaporation Pond 3 was designed to divert runoff associated with the 100 year 24 hour event around the impoundment. The impoundment design includes retaining rainfall that is associated with the 100 year 24 hour storm event.

III. COMPLIANCE WITH AQUIFER WATER QUALITY STANDARDS

OPERATIONAL MONITORING AND REPORTING REQUIREMENTS

Fluid Level Monitoring

The permit requires the permittee to collect fluid elevation measurements in Evaporation Pond 3, on a weekly basis. The permit requires the permittee to use this data to monitor and evaluate changes in fluid levels and sudden drops in fluid levels for the purpose of maintaining freeboard requirements and allowing assessment of liner failure or abnormal liner leakage. The permit contains contingency plan requirements for responding to performance standard/alert level exceeded conditions, an exceeded freeboard level, and overtopping of the impoundment.

LCRS Sump Monitoring – the permit requires daily comparisons of fluid in the LCRS sumps with liner leakage alert levels (AL1 for normal liner leakage and AL2 for excessive liner leakage) that are in the permit.

Performance Level Monitoring

The permit requires routine inspections of the impoundment regulated by this permit. The impoundment is inspected for a series of performance levels including: maintaining freeboard (the separation required between the operating level and the top of the berm); overtopping; fluid level and sudden loss of fluid; liner integrity; dam and berm integrity; LCRS function; and storm water diversion and control.

Wastewater Sampling – Evaporation Ponds

The wastewater in the impoundment consists primarily of cooling tower blowdown. The wastewater was characterized as part of the Area-wide APP. This information is on file with ADEQ under Inventory No. 100388. Additional characterization was not required for issuance of this permit.

The control technology design of Evaporation Pond 3 is better than the current industry standard. Given the design which is better than standard BADCT for industrial impoundments, the permit does not require routine wastewater sampling.

GROUNDWATER MONITORING AND REPORTING REQUIREMENTS

The pollutant management area (PMA) for this individual APP is a line circumscribing the impoundment, as shown in Figure 2.

For the area-wide APP, a perimeter groundwater monitoring program has been developed to ensure that wells provide detection of impacted groundwater prior to any off-site migration of groundwater. To date, no Aquifer Quality Limits (AQLs) have been exceeded for any wells at the site and the monitoring program suggests that the drinking water aquifer is protected. For this permit, since the proposed design is better than state of the art BADCT, groundwater monitoring is not required. The POC location in the permit is a contingency point only. A well has been installed at the location of APP-4R for monitoring performed under the area-wide APP.

Transducers - APS has installed transducers in the majority of the wells on site. This allows the permittee to acquire continuous groundwater elevation measurements. (The list of wells in which transducers have been or will be installed can be found in Table 16.2-30 of the Area-Wide APP.) Transducers enable the detection of slight changes in groundwater elevation that may be the result of leakage from an impoundment or infiltration of stormwater and comparison of that data “real time” with other data collected at the site. Real time comparisons will facilitate identification of potential issues requiring attention under the permit contingency requirements, such as discerning if there is an issue with BADCT for a particular surface impoundment which needs to be corrected. Monitoring of groundwater elevations using transducers is a requirement of the Area-wide APP.

Overall groundwater elevations at the facility are declining. Hydrographs for several key wells show either flat or increasing decreasing elevation trends. ADEQ plans to keep an eye on these wells in conjunction with other data (such as groundwater quality data in wells) to see if response actions are needed to address BADCT performance. Installation of transducers, submittal of hydrographs and routine evaluation and interpretation of water elevation data will collectively result in more efficient use of both APS and ADEQ resources in the timely and effective identification of potential leakages.

Establishing ALs and AQLs for the Permit

No groundwater monitoring is required for this permit.

Groundwater Monitoring and Compliance with AWQS at the POC

This permit is for an impoundment that is constructed with 3 liners and an LCRS. Because additional protection is offered by the third liner and an LCRS system will be monitored under this permit, routine groundwater monitoring is not a requirement of this permit.

Groundwater monitoring will be performed at POC well APP-4R under the Area-wide APP. Therefore, data will be available to support the demonstration of compliance with AWQS at the POC, if necessary. However, given the BADCT design, the primary demonstration is made through engineering control at the impoundment.

IV. STORM WATER AND SURFACE WATER CONSIDERATIONS

Stormwater runoff is controlled at the site by various storm water management systems. Storm water runoff from the power plant area is diverted and collected in a series of gunite-lined canals and earthen ditches and diverted to the two sedimentation basins located at the plant site. Sedimentation Basin 2 also receives limited amounts of discharges which meet the requirements of A.R.S. § 49-250(B)(23). Both sedimentation basins have received unauthorized wastewater discharges in the past during plant emergencies/upset conditions. All non-storm water and non-exempt discharges to the sedimentation basins are regulated by this APP.

V. COMPLIANCE SCHEDULE

This permit contains one compliance schedule requirement for submittal of the Final Construction Report including QA/QC documentation and as-builts, 90 days after completion of construction and no later than November 1, 2008.

VI. OTHER REQUIREMENTS FOR ISSUING THIS PERMIT

Technical Capability

The Arizona Public Service Company (Permittee) has demonstrated the ability to maintain the technical competence necessary to carry out the terms and conditions of the APP in accordance with A.R.S. § 49-243(N) and A.A.C. R18-9-A202(B).

Updated plant contact information was provided to ADEQ by APS as a part of this amendment to ensure that technical capability requirements are maintained. The permit requires that appropriate documents be sealed by an Arizona registered geologist or professional engineer. This requirement is a part of on-going demonstration of technical capability. The demonstration also included contractor's licenses and technical qualifications for Tiffany Construction, the general construction contractor, and GSE, the lining manufacturer and installer.

Financial Capability

APS has demonstrated the financial responsibility necessary to carry out the terms and conditions of the permit in accordance with A.R.S. § 49-243(N) and A.A.C. R18-9-A203(C)(1). The permittee is expected to maintain financial capability throughout the life of the facility. The estimated cost to close Evaporation Pond 3 is approximately \$8,796,400, assuming clean closure is attained.

Zoning Requirements

The Palo Verde Nuclear Generating Station has been properly zoned for industrial use and the permittee has complied with all Maricopa County zoning ordinances in accordance with A.R.S. § 49-243(O) and A.A.C. R18-9-A201(A)(2).

VII. ADMINISTRATIVE INFORMATION

Public Notice (A.A.C. R18-9-108(A))

The public notice is the vehicle for informing all interested parties and members of the general public of the contents of a draft permit or other significant action with respect to a permit or application. The basic intent of this requirement is to ensure that all interested parties have an opportunity to comment on significant actions of the permitting agency with respect to a permit application or permit. This permit was public noticed in a local newspaper after a pre-notice review by the applicant and other affected agencies. Public notices were published on _____ 2008 in two papers, the West Valley View and the Arizona Republic Business Gazette.

Public Comment Period (A.A.C. R18-9-109(A))

The aquifer protection program rules require that permits be public noticed in a newspaper of general circulation within the area affected by the facility or activity and provide a minimum of 30 calendar days for interested parties to respond in writing to ADEQ. After the closing of the public comment period, ADEQ is required to respond to all significant comments at the time a final permit decision is reached or at the same time a final permit is actually issued.

Public Hearing (A.A.C R18-9-109(B))

A public hearing may be requested in writing by any interested party. The request should state the nature of the issues proposed to be raised during the hearing. A public hearing will be held if the Director determines there is a significant amount of interest expressed during the 30-day public comment period, or if significant new issues arise that were not considered during the permitting process.

VIII. ADDITIONAL INFORMATION

Additional information relating to this proposed permit may be obtained from:

Arizona Department of Environmental Quality
Water Quality Division – Groundwater Section
Attn: Michele Robertson, Section Manager
1110 W. Washington St., Mail Code 5415B-3
Phoenix, Arizona 85007
Phone: (602) 771- 4827

Or, directed to the Expedited APP Agent for ADEQ:
Engineering and Environmental Consultants, Inc. (EEC)
Kristie Kilgore, Sr. Project Manager
4625 E. Fort Lowell Road
Tucson, AZ 85712
(520)321-4625

IX. LIST OF FIGURES AND ATTACHMENTS

Figures

- 1-Site Location and Property Boundaries
- 2 –Evaporation Pond 3 Pollutant Management Area